Appendix VII. Stream and River Monitoring Studies and Data Plots

USGS 1989-1990 Reconnaissance Study of Mid-Western Streams (USGS Open-File Report 93-457):

In 1989, the USGS collected one "pre-application" sample, one "post-application" sample and one "Fall" sample from 52, 129, and 143 mid-western streams, respectively, across 10 states. In 1990, the USGS collected one "pre-application" sample, and one "post-application" sample from 52 and 50 mid-western streams, respectively, across 10 states. "Pre-application" samples were generally collected in March or April before the applications of various herbicides. "Post-application" samples were collected during May or June during the first runoff event following the bulk of herbicide applications. "Fall" samples were generally collected in October or November.

The samples were analyzed for a number of pesticides including atrazine, DEA, and DIA. The number of samples collected at each site (1-3 depending upon the site) was not adequate for EFED to generate atrazine, DEA, and DIA time series curves. However, EFED generated 1989 pre-application, post-application, and Fall cumulative exceedence curves of atrazine, DEA, and DIA concentrations versus the % of sites with equal or greater concentrations. EFED also generated 1990 pre-application and post-application cumulative exceedence curves for those chemicals. The post application plots of 1989 and 1990 are presented in Figures VII -1 and 2.

USGS 1990-1992 Study of 9 Mid-western Rivers/Streams (USGS Open-File Report 94-396):

The USGS sampled each of 9 mid-western rivers/streams several hundred times from April 1990 through July 1990. Samples were manually collected 1-2 times per week and automatically collected during runoff events either at several hour intervals or in response to changes in flows. During runoff events, 2-4 samples were typically collected at different times on the same day. The samples were analyzed for a number of pesticides including atrazine. Using the same sampling methodology in the Spring/Summer of 1991, the USGS collected additional samples from 2 of the 9 rivers/streams (the Iroquois River in IL and the Sangamon River in IL) from April 1991 through March 1992

The number of sites sampled (9) and the number of years sampled (1-2) were too low for EFED to generate cumulative exceedence curves from the data. However, EFED did generate two sets of atrazine time series curves from the data. In one set of atrazine time series curves, EFED plotted the average of the atrazine concentrations in all of the samples collected on the same day during a runoff event. In the other set of atrazine time series curves, EFED plotted the maximum atrazine concentration in all of the samples collected on the same day during a runoff event.

USGS April 1991 to September 1992 Study of the Mississippi River Basin (USGS Open-File Report 93-657):

The USGS sampled 8 sites within the Mississippi Basin from April 1991 through September 1992. Three of the sampling sites were on the Mississippi River. The other 5 sampling sites were on other rivers within the Mississippi Basin. Two samples were collected per week from May 6 to July 15, 1991. One sample was collected every two weeks from November 1991 through February 1992. One sample was collected per week during all other periods of the study (April 1991, July 15, 1991-October 30, 1991 and March 1992-July 1992). The samples were analyzed for a number of pesticides including atrazine.

The number of sites sampled (8) and the number of years sampled (1) were too low for EFED to generate cumulative exceedence curves from the data. However, EFED did generate atrazine time series curves from the data.

USGS 1994-1995 Reconnaissance Study of Mid-Western Streams (USGS Open-File Report 98-181):

In 1994, the USGS collected one "pre-application" sample, and one "post-application" sample from 52 and 50 mid-western streams, respectively, across 8 states. In 1995, the USGS collected one "post-application" sample from 50 mid-western streams across 7 states. "Pre-application" samples were generally collected in March or April before the applications of various herbicides. "Post-application" samples were collected during May or June during the first runoff event following the bulk of herbicide applications.

The samples were analyzed for a number of pesticides including atrazine, DEA, and DIA. The number of samples collected at each site (1-2 depending upon the site) was not adequate for EFED to generate atrazine, DEA, and DIA time series curves. However, EFED generated 1994 and 1990 pre-application and post-application cumulative exceedence curves of atrazine, DEA, and DIA concentrations versus the % of sites with equal or greater concentrations. EFED also generated 1995 post-application cumulative exceedence curves for those chemicals. The post application plots of 1994 and 1995 are presented in Figures VII -3 and 4.

Fig. VII - 1 1989 USGS Reconnaisance
Post-App. Tot. Triazine Cum Freq Curve

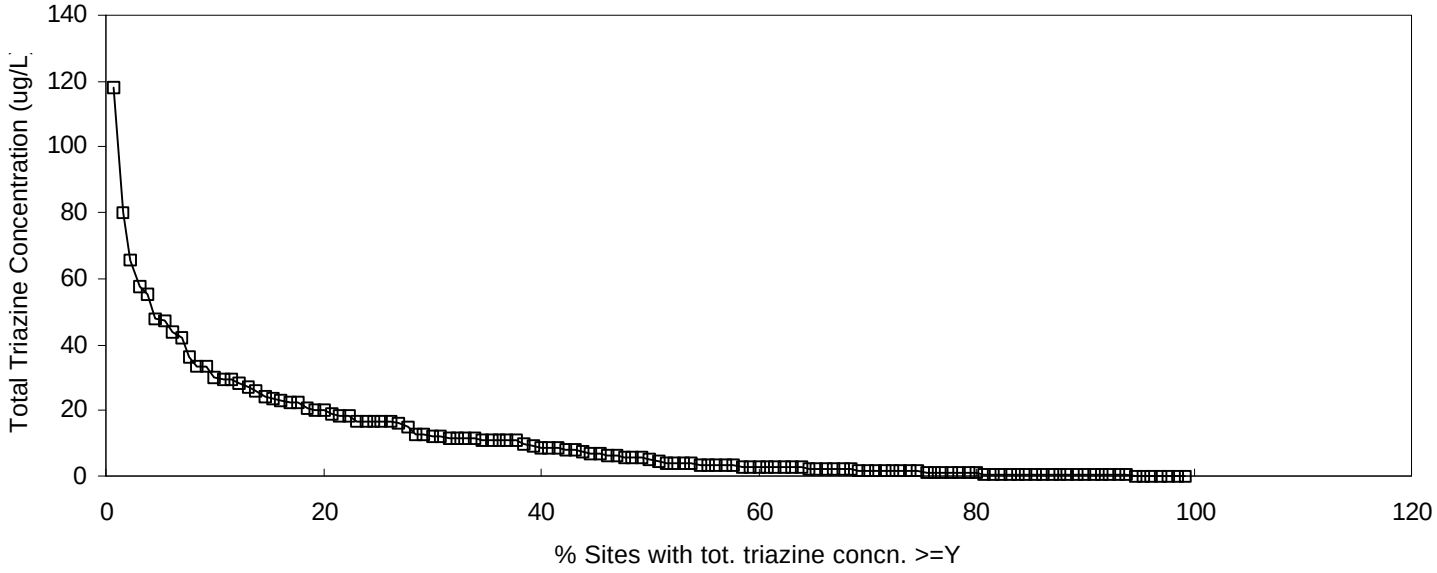


Fig. VII -2 1990 USGS Reconnaisance
Post-App. Tot. Triazine Cum Freq Curve

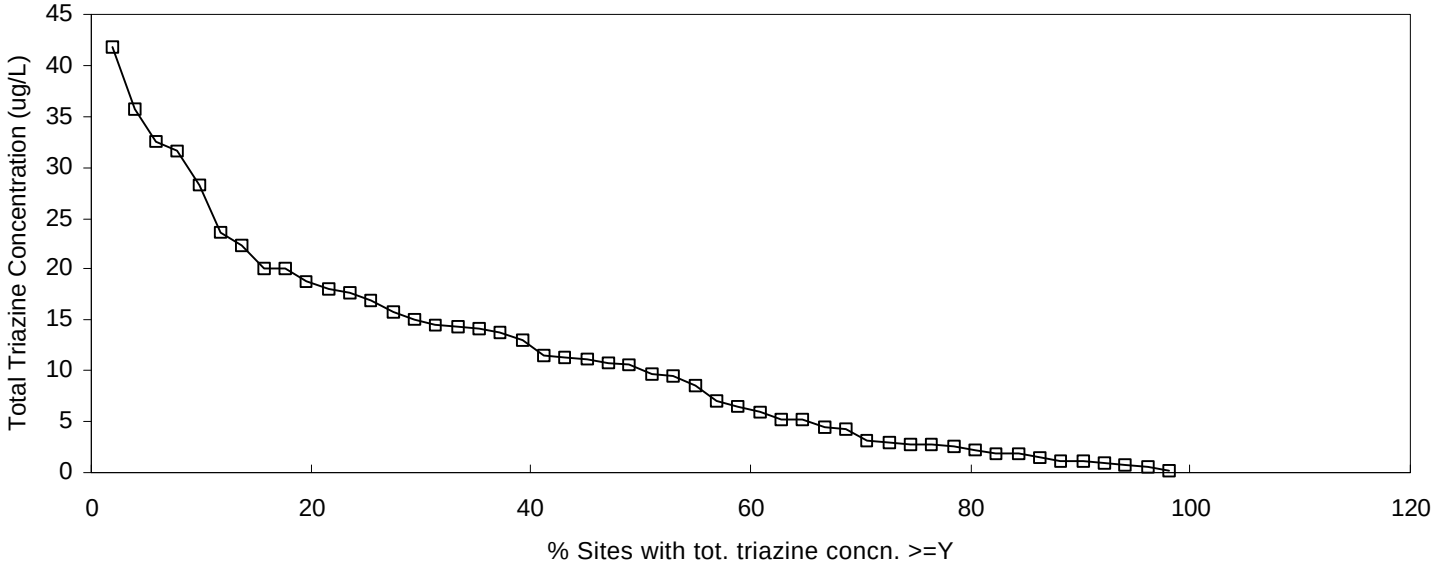


Figure VII - 3. 1994 USGS Reconnaisance
Post-App. Atrazine Cum. Freq. Curve

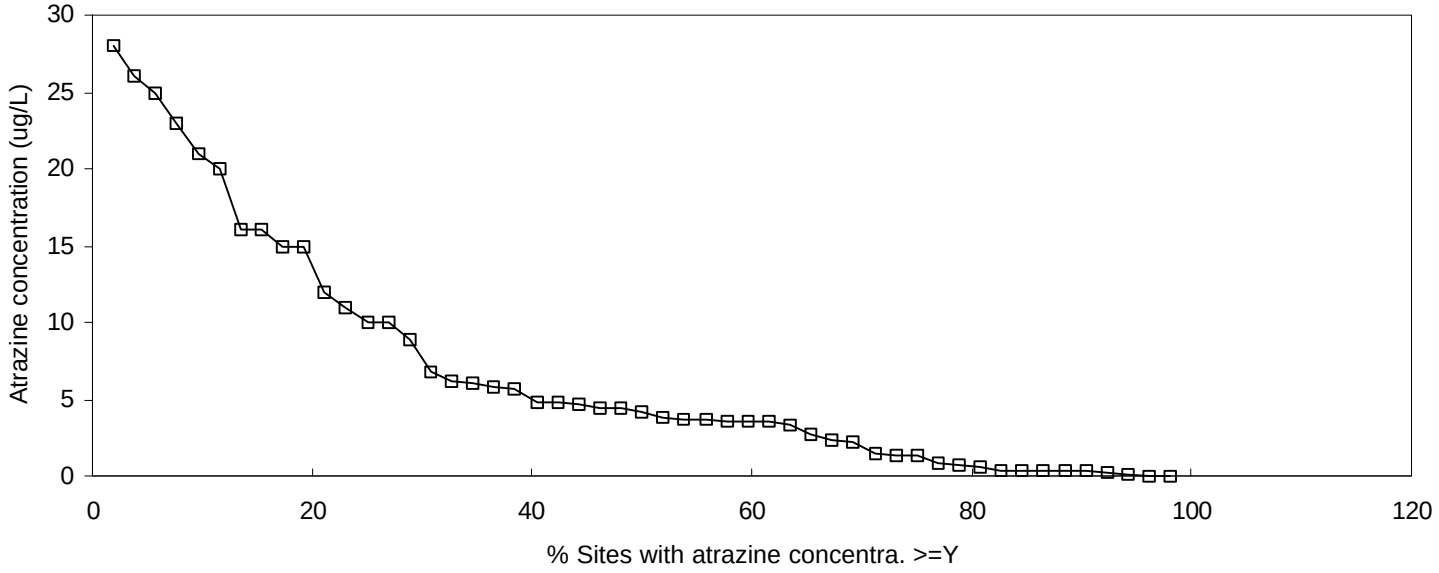
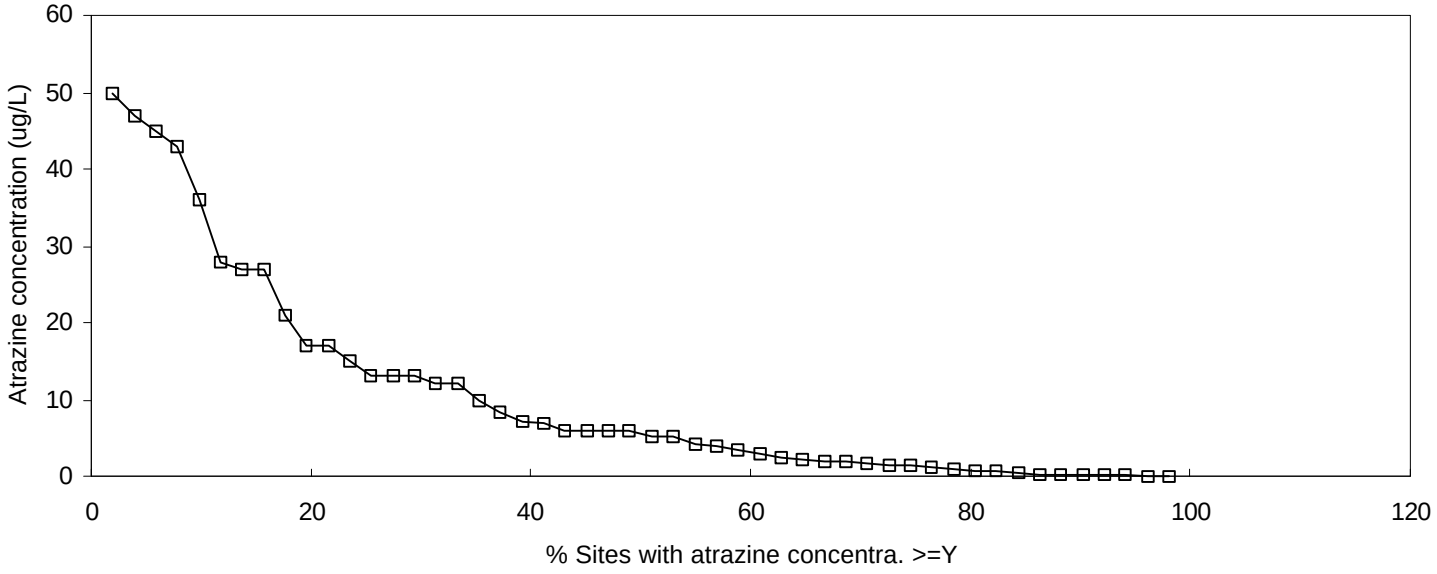
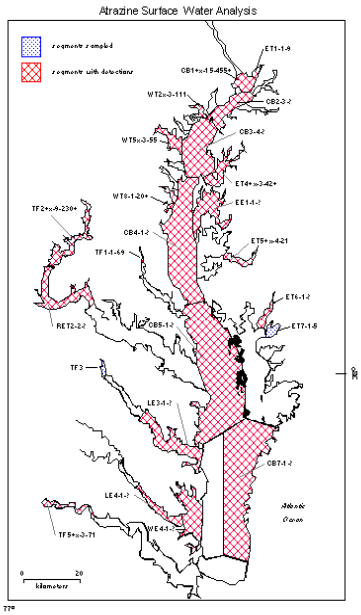


Figure VII - 4. 1995 USGS Reconnaisance
Post-App. Atrazine Cum. Freq. Curve



Appendix VIII. Chesapeake Bay Monitoring Data on Atrazine Levels

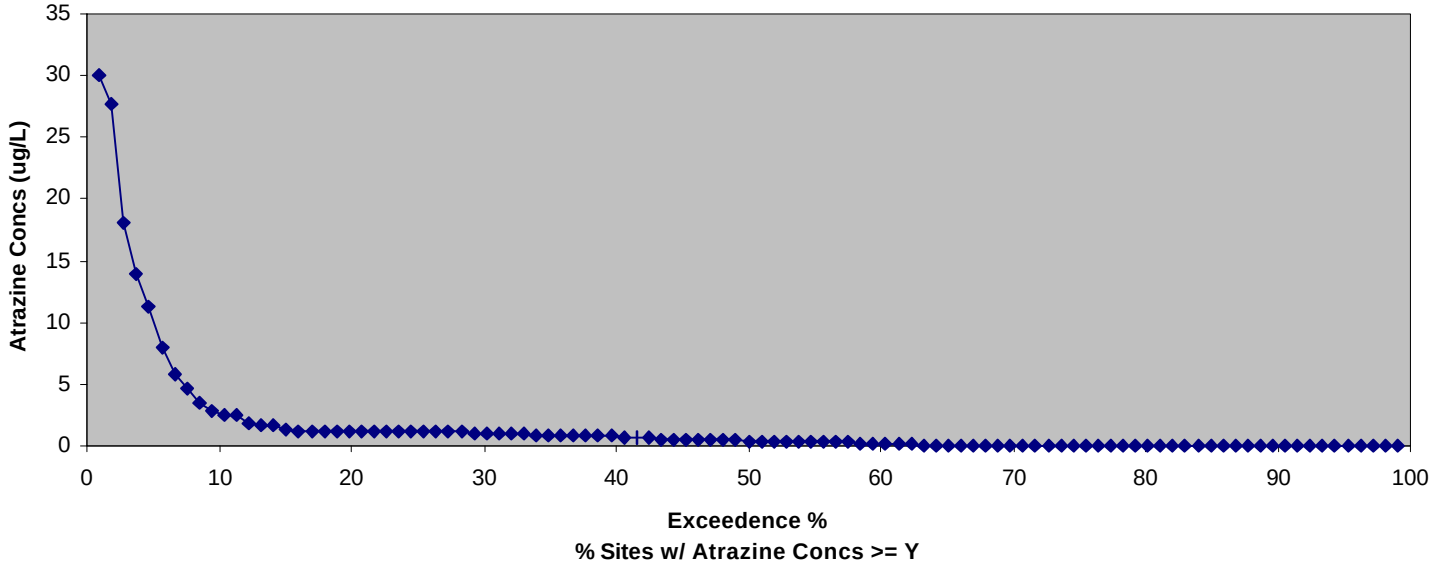
Some atrazine monitoring data are presented in the web site, entitled "Data Base of the Occurrence and Distribution of Pesticides in Chesapeake Bay" (address: www.agnic.nal.usda.gov/cbp/pest/atrazine.html). The sampling matrix included biota, groundwater, runoff, sediment, suspended particulate, and surface water. The map of atrazine surface water sampling site is shown below:



The results are the compilation of the relevant data from forty-nine published and unpublished studies that deal with occurrence of pesticides in the Chesapeake bay, its estuaries, and its biota. Results from the Chesapeake Bay monitoring data of atrazine in bay water is shown as Figure VIII-1. The summary table shown below indicates that the maximum atrazine level found is 30 µg/L and the 90th percentile value is about 2.7 µg/L.

	Maximum
peak	30
# station - year	105
95%ile	10.268
90%ile	2.652
75%ile	1.175
50%ile	0.4

Figure VIII-1. Surface Water Monitoring Results for Atrazine in the Chesapeake Bay's Tidal Rivers Maximxum Concentrations by Site and Year (1977 - 1993)



Appendix IX. Documentation of Terrestrial Fate Residue Model and Data

The model of Hoerger and Kenega (1972), as modified by Fletcher et al. (1994) was used to estimate pesticide concentrations on selected avian or mammalian food items. This model predicts the maximum concentrations that may occur immediately following a direct application at 1 lb ai/A. For 1 lb ai/A applications, peak concentrations (i.e., Day 0) on short grass, tall grass, broadleaf plants, and fruits are predicted to be as high as 240, 110, 135, and 15 ppm, respectively. The residue monitoring on which this model was based, did not include insects. However, based on similar surface area to volume ratio between insects and some plant parts, the predicted maximum concentration for broadleaf plants and fruits are used to represent maximum concentrations that may occur on small and large insects, respectively. Linear extrapolation is then used to estimate maximum terrestrial EEC's for single applications at application rates other than 1 lb ai/A. For example, a single application at 4 lbs ai/A would result in peak concentrations of 960 for short grass, 440 ppm for tall grass, 540 ppm for broadleaf foliage and small insects, and 60 ppm for fruits and large insects. If multiple applications are permitted, the peak terrestrial EECs resulting from subsequent applications are estimated by summing the maximum EEC predicted for the last application with the remaining concentrations predicted for the previous application(s). After application, residues on food items are predicted to decline according to a first order exponential model. If the maximum initial concentration is C_0 and the half-life for the exponential dissipation of the active ingredient is $t_{1/2}$, the remaining concentration at time t is given by the following formula:

$$C_t = C_0 e^{-\frac{t \ln 2}{t_{1/2}}}$$

The general formula for the peak EEC (C_{peak}) following multiple applications is:

$$C_{peak} = \sum_{i-1}^{n} C_0 e^{-\frac{I(n-1)\ln 2}{t_{1/2}}}$$

where C_0 is the maximum initial concentration after one application, I is the interval in days between applications, n is the number of applications, and $t_{1/2}$ is the half-life of the active ingredient.

The initial concentration, half-life, number of applications, interval between treatments, and length of simulation are variable. The current Fate Model has two limitations: 1) for more than two applications, only one time interval can be designated for a run; and 2) between treatments per fate run (i.e., two or more treatment intervals can not be used per run).
Four examples of Fate Model printouts follow; one each for short grass, foliage and small insects, long grass, and fruits, seeds and large insects.

The data tables used in the risk assessment for sugarcane, corn and sorghum are presented below.

DAILY PESTICIDE RESIDUE LEVELS ------ MAXIMUM. SUGARCANE USE RATE
SINGLE APPLICATION AT 4 LB AI./A ON SHORT GRASS

Chemical name ---------- Atrazine
Initial concentration (ppm) ---------- 960
Half-life ---------- 17
Length of simulated (day) ---------- 160

DAY	RESIDUE (PPM)	DAY	RESIDUE (PPM)	DAY	RESIDUE (PPM)
0	960	46	147.1362	92	22.5511
1	921.6448	47	141.2576	93	21.6501
2	884.822	48	135.6139	94	20.78511
3	849.4704	49	130.1957	95	19.95467
4	815.5313	50	124.9939	96	19.15742
5	782.9481	51	120	97	18.39.202
6	751.6668	52	115.2056	98	17.6572
7	721.6352	53	110.6027	99	16.95173
8	692.8035	54	106.1838	100	16.27446
9	665.1237	55	101.9414	101	15.62424
10	638.5498	56	97.8685	102	15
11	613.0376	57	93.95834	103	14.4007
12	588.5447	58	90.20439	104	13.82534
13	565.0304	59	86.60042	105	13.27297
14	542.4556	60	83.14045	106	12.74267
15	520.7826	61	79.81871	107	12.23356
16	499.9757	62	76.6297	108	11.74479
17	480	63	73.56808	109	11.27555
18	460.8224	64	70.62878	110	10.82505
19	442.411	65	67.80693	111	9.977337
20	424.7352	66	65.09783	112	9.578712
21	407.7656	67	62.49695	113	9.578712
22	391.4741	68	60	114	9.196009
23	375.8334	69	57.6028	115	8.828598
24	360.8176	70	55.30138	116	8.475866
25	346.4017	71	53.0919	117	8.137228
26	332.5618	72	50.9707	118	7.812118
27	319.2749	73	48. 9342	119	7.5
28	306.5188	74	46.97917	120	7.200348
29	294.2724	75	45.10219	121	6.91267
30	282.5152	76	43.3002	122	6.636485
31	271.2278	77	41.57022	123	6.371336
32	260.3913	78	39.90935	124	6.116781
33	249.9878	79	38.31484	125	5.872396
34	240	80	36.78403	126	5.637774
35	230.4112	81	35.31439	127	5.412525
36	221.2055	82	33.90347	128	5.196277
37	212.3676	83	32.54891	129	4.988669
38	203.8828	84	31.24847	130	4.789353
39	195.737	85	30	131	4.598002
40	187.9167	86	28.8014	132	4.414299
41	180.4088	87	27.65069	133	4.237933
42	173.2009	88	26.54595	134	4.068614
43	166.2809	89	25.48535	135	3.906059
44	159.6374	90	24.46713	136	3.75
45	153.2594	91	23.48958	137	3.600173

Maximum residue ---------- 960
Average residue ---------- 149.0321

DAILY PESTICIDE RESIDUE LEVELS ------ MAXIMUM. SUGARCANE USE RATE
SINGLE APPLICATION AT 4 LB AI./A ON BROADLEAF FOLIAGE

Chemical name ---------- Atrazine
Initial concentration (ppm) ---------- 540
Half-life ---------- 17
Length of simulated (day) ---------- 100

DAY	RESIDUE (PPM)	DAY	RESIDUE (PPM)	DAY	RESIDUE (PPM)
0	540	46	82.7641	92	12.68499
1	518.4252	47	79.45738	93	12.17818
2	497.7124	48	76.2828	94	11.69162
3	477.8271	49	73.23506	95	11.2245
4	458.7364	50	70.30907	96	10.77605
5	440.4084	51	67.5	97	10.34551
6	422.8126	52	64.80314	98	9.932172
7	405.9198	53	62.21404	99	9.53535
8	389.7019	54	59.72839	100	9.154381
9	374.1321	55	57.34204		
10	359.1842	56	55.05104		
11	344.8336	57	52.85157		
12	331.0564	58	50.73997		
13	317.8296	59	48.71274		
14	305.1313	60	46.7665		
15	292.9402	61	44.89802		
16	281.2363	62	43.1042		
17	270	63	41.38205		
18	259.2126	64	39.72869		
19	248.8562	65	38.1414		
20	238.9136	66	36.61753		
21	229.3682	67	35.15453		
22	220.2042	68	33.75		
23	211.4063	69	32.40157		
24	202.9599	70	31.10702		
25	194.851	71	29.86419		
26	187.066	72	28.67102		
27	179.5921	73	27.52552		
28	172.4168	74	26.42578		
29	165.5282	75	25.36998		
30	158.9148	76	24.35636		
31	152.5656	77	23.38325		
32	146.4701	78	22.44901		
33	140.6182	79	21.55209		
34	135	80	20.69102		
35	129.6063	81	19.86435		
36	124.4281	82	19.0707		
37	119.4568	83	18.30876		
38	114.6841	84	17.57727		
39	110.1021	85	16.875		
40	105.7031	86	16.20079		
41	101.4799	87	15.55351		
42	97.42548	88	14.9321		
43	93.53301	89	14.33551		

Maximum residue ---------- 540
Average residue ---------- 131.6416

DAILY PESTICIDE RESIDUE LEVELS ------ MAXIMUM. CORN & SORGHUM USE RATES
SINGLE APPLICATION AT 2 LB AI./A ON SHORT GRASS

Chemical name ---------- Atrazine
Initial concentration (ppm) ---------- 480
Half-life ---------- 17
Length of simulated (day) ---------- 100

DAY	RESIDUE (PPM)	DAY	RESIDUE (PPM)	DAY	RESIDUE (PPM)
0	480	46	73.56808	92	11.27555
1	460.8224	47	70.62878	93	10.82505
2	442.411	48	67.80693	94	10.39255
3	424.7353	49	65.09783	95	9.977337
4	407.7657	50	62.49695	96	9.578709
5	391.4741	51	60	97	9.196009
6	375.8334	52	57.60279	98	8.828598
7	360.8176	53	55.30137	99	8.475866
8	346.4017	54	53.0919	00	8.137228
9	332.5618	55	50.9707		
10	319.2749	56	48.93425		
11	306.5188	57	46.97917		
12	294.2724	58	45.1022		
13	282.5152	59	43.30022		
14	271.2278	60	41.57023		
15	260.3913	61	39.90936		
16	249.9878	62	38.31485		
17	240	63	36.78404		
18	230.4112	64	35.31439		
19	221.2055	65	33.90346		
20	212.3676	66	32.54891		
21	203.8828	67	31.24848		
22	195.737	68	30		
23	187.9167	69	28.8014		
24	180.4088	70	27.65069		
25	173.2009	71	26.54595		
26	166.2809	72	25.48535		
27	159.6374	73	24.46713		
28	153.2594	74	23.48958		
29	147.1362	75	22.5511		
30	141.2576	76	21.6501		
31	135.6139	77	20.78511		
32	130.1957	78	19.95467		
33	124.9939	79	19.15742		
34	120	80	18.39201		
35	115.2056	81	17.6572		
36	110.6028	82	16.95173		
37	106.1838	83	16.27446		
38	101.9414	84	15.62424		
39	97.8685	85	15		
40	93.95833	86	14.4007		
41	90.20439	87	13.82534		
42	86.60042	88	13.27298		
43	83.14046	89	12.74267		
44	79.81872	90	12.23356		
45	76.6297	91	11.74479		

Maximum residue ---------- 480
Average residue ---------- 117.0147

DAILY PESTICIDE RESIDUE LEVELS ------ MAXIMUM. CORN & SORGHUM USE RATES
SINGLE APPLICATION AT 2 LB AI./A ON BROADLEAF FOLIAGE

Chemical name ---------- Atrazine
Initial concentration (ppm) ---------- 270
Half-life ---------- 17
Length of simulated (day) ---------- 100

DAY	RESIDUE (PPM)	DAY	RESIDUE (PPM)	DAY	RESIDUE (PPM)
0	270	46	41.38205	92	6.342496
1	259.2126	47	39.72869	93	6.089091
2	248.8562	48	38.1414	94	5.845812
3	238.9136	49	36.61753	95	5.612252
4	229.3682	50	35.15453	96	5.388024
5	220.2042	51	33.75	97	5.172756
6	211.4063	52	32.40157	98	4.966087
7	202.9599	53	31.10702	99	4.767675
8	194.851	54	29.86419	100	4.577191
9	187.066	55	28.67102		
10	179.5921	56	27.52552		
11	172.4168	57	26.42578		
12	165.5282	58	25.36999		
13	158.9148	59	24.35637		
14	152.5656	60	23.38325		
15	146.4701	61	22.44901		
16	140.6182	62	21.5521		
17	135	63	19.86435		
18	129.6063	64	19.0707		
19	124.4281	65	18.30876		
20	119.4568	66	17.57727		
21	114.6841	67	16.875		
22	110.1021	68	16.20079		
23	105.7031	69	15.55351		
24	101.4799	70	14.9321		
25	97.42548	71	14.33551		
26	93.53301	72	13.76276		
27	89.79606	73	13.21289		
28	86.20841	74	13.21289		
29	82.7641	75	12.68499		
30	79.45739	76	12.17818		
31	76.28281	77	11.69162		
32	73.23506	78	11.2245		
33	70.30908	79	10.77605		
34	67.5	80	10.34551		
35	64.80315	81	9.932172		
36	62.21405	82	9.53535		
37	59.72839	83	9.154381		
38	57.34204	84	8.788632		
39	55.05104	85	8.4375		
40	52.85156	86	8.100393		
41	50.73997	87	7.776756		
42	48.71274	88	7.466048		
43	46.76651	89	7.167754		
44	44.89803	90	6.881379		
45	43.1042	91	6.606445		

Maximum residue ---------- 270
Average residue ---------- 65.8208

Appendix X. Terrestrial Plant Exposure Formulae

Calculating EECs for terrestrial plants inhabiting dry areas adjacent to treatment sites

Unincorporated ground application:
Runoff = maximum application rate (lbs ai/A) x runoff value
Drift = maximum application rate x 0.01
Total Loading = runoff (lbs ai/acre) + drift (lbs ai/A)

Incorporated ground application:
Runoff = [maximum application rate (lbs ai/A) ÷
minimum incorporation depth (cm.)] x runoff value
Drift = maximum application rate x 0.01
(Note: drift is not calculated if the product is incorporated at the time of application.)
Total Loading = runoff (lbs ai/A) + drift (lbs ai/A)

Aerial, airblast, forced-air, and chemigation applications:
Runoff = maximum application rate (lbs ai/A) x 0.6
(60% application efficiency assumed) x runoff value
Drift = maximum application rate (lbs ai/A) x 0.05
Total Loading = runoff (lbs ai/A) + drift (lbs ai/A)

Calculating EECs for terrestrial plants inhabiting semi-aquatic low-lying areas

Unincorporated ground application:
Runoff = maximum application rate (lbs ai/A) x runoff value x 10 acres
Drift = maximum application rate x 0.01
Total Loading = runoff (lbs ai/A) + drift (lbs ai/A)

Incorporated ground application:
Runoff = [maximum application rate (lbs
ai/A)/minimum incorporation depth (cm)] x runoff value x 10 acres
Drift = maximum application rate x 0.01
(Note: drift is not calculated if the product is incorporated at the time of application.)
Total Loading = runoff (lbs ai/A) + drift (lbs ai/A)

Aerial, airblast, and forced-air applications:
Runoff = maximum application rate (lbs ai/acre) x 0.6
(60% application efficiency assumed) x runoff value x 10 acres
Drift = maximum application rate (lbs ai/A) x 0.05
Total Loading = runoff (lbs ai/A) + drift (lbs ai/A)

Appendix XII. Submitted Ecological Effects Studies

Atkins, E. L., E. A. Greywood and R. L. MacDonald. 1975. Toxicity of pesticides and other agricultural chemicals to honey bees: Laboratory studies. Prepared by Univ. of Calif., Div. Agric. Ser., Leaflet 2287. 38 p. (MRID No. 00036935).

Beliles, R. P. and W. J. Scott, Jr. 1965. Atrazine safety evaluation on fish and wildlife (Bobwhite quail, mallard ducks, rainbow trout, sunfish, goldfish). Prepared by Woodard Res. Corp.; submitted by Geigy Chemical Co., Ardsley, NY. (MRID No. 00059214).

Beliles, R. P. and W. J. Scott, Jr. 1965. Atrazine safety evaluation on fish and wildlife (Bobwhite quail, mallard ducks, rainbow trout, sunfish, goldfish): Atrazine: Acute toxicity in goldfish. Prepared by Woodard Res. Corp.; submitted by Ciba-Geigy Corp., Greensboro, NC. (MRID No. 00024718).

Beliles, R. P. and W. J. Scott, Jr. 1965. Atrazine safety evaluation on fish and wildlife Bobwhite quail, mallard ducks, rainbow trout, sunfish, goldfish): Atrazine: Acute toxicity in rainbow trout. Prepared by Woodard Res. Corp.; submitted by Ciba-Geigy Corp., Greensboro, NC. (MRID No. 00024716).

Beliles, R. P. and W. J. Scott, Jr. 1965. Atrazine safety evaluation on fish and wildlife (Bobwhite quail, mallard ducks, rainbow trout, sunfish, goldfish): Atrazine: Acute toxicity in sunfish. Prepared by Woodard Res. Corp.; submitted by Ciba-Geigy Corp., Greensboro, NC. (MRID No. 00024717).

Bentley, R. E. and K. J. Macek. 1973. Acute toxicity of atrazine to mud crab *(Neopanope texana*). Prepared by Bionomics, Inc.; Submitted by Ciba-Geigy Corp., Greensboro, NC. (MRID No. 00024719).

Buccafusco, R. 1976. Acute toxicity of Atrazina technical to bluegill (*Lepomis macrochirus*). Prepared by EG & G Bionomics, Wareham, MA; submitted by unknown. (MRID No. 00147125).

Chetram, R. S. 1989. Atrazine: Tier 2 seed emergence nontarget phytotoxicity test. Lab, Study No. LR 89-07C. Prepared by Pan-Agricultural Laboratories, Inc., Madera, CA.; submitted by Ciba-Geigy Corporation, Greensboro, NC. (MRID No. 42041403).

Chetram, R. S. 1989. Atrazine: Tier 2 seed germination nontarget phytotoxicity test. Lab, Study No. LR 89-07B. Prepared by Pan-Agricultural Laboratories, Inc., Madera, CA.; submitted by Ciba-Geigy Corporation, Greensboro, NC. (MRID No. 41223001).

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Appendix XIII. Endangered Species Concerns

Atrazine poses a risk to a number of sensitive crop species from spray drift and spray drift/runoff assessments.

The Agency has developed a program (the "Endangered Species Protection Program") to identify pesticides whose use may cause adverse impacts on endangered and threatened species, and to implement mitigation measures that will eliminate the adverse impacts. At present, the program is being implemented on an interim basis as described in a Federal Register notice (54 FR 27984-28008, July 3, 1989), and is providing information to pesticide users to help them protect these species on a voluntary basis. As currently planned, but subject to change as the program develops, the final program will call for label modifications referring to required limitations on pesticide uses, typically as depicted in county-specific bulletins or by other site-specific mechanisms as specified by state partners. A final program, which may be altered from the interim program, will be described in a future Federal Register notice. The Agency is not imposing label modifications at this time through the RED. Rather, any requirements for product use modifications will occur in the future under the Endangered Species Protection Program.

Levels of Concern for Endangered species are exceeded for terrestrial plants and vascular aquatic plants. Risk quotients exceed the levels of concern for endangered terrestrial plant species from spray drift and from runoff for both terrestrial and semi-aquatic plants. The level of concern for endangered plant species has been exceeded for atrazine uses on corn, sorghum and sugarcane for both maximum and typical use rates.

In general, risks to birds, mammals, beneficial insects, fish and aquatic invertebrates are not anticipated from direct effects of atrazine use and the levels of concern are not exceeded. However, atrazine use could have important effects on terrestrial and aquatic plants in areas adjacent to treated fields that would have indirect effects on these animals from the loss of food sources and the loss of vegetative habitat for cover, reproduction and the survival of offspring. Loss of food and vegetative habitat could force the animals to leave the affected areas and seek another acceptable habitats. Limits on acceptable habitats would increase stress on species competing for limited resources and may affect the ability to successfully reproduce and feed the young.

Kettle et al. (1987) demonstrated severe vegetative habitat and indirect effects from 20 µg/L of atrazine in artificial Kansas ponds. Atrazine effects in the ponds included 60 to 90 percent reduction in vascular pond vegetation and the loss of three plant species, significant reductions in aquatic macro-invertebrate populations, a significant reduction in food consumption by adult bluegills, and a 96 percent reduction in the number of young bluegill. It is likely that reductions in the number of macro-invertebrates are due to the loss of vegetative cover to avoid predators and that bluegill young were eaten due to limited vegetative cover and the reduced availability of food (i.e., aquatic invertebrates) for adult fish species. Atrazine levels of 20 µg/L in streams and rivers are not rare occurrences and these concentrations may adversely affect aquatic vegetation, such

that the loss of the vegetative habitat could affect populations of endangered aquatic invertebrates, especially crustaceans and the recruitment of young endangered fish species.

It is uncertain what effects atrazine use on crops and forests might have on vegetation in field margins and riparian areas that are necessary and important habitats for movement, cover, feeding, and reproduction for terrestrial endangered animal species, including endangered insects, amphibians, fish, birds and mammals. Riparian areas along aquatic habitats moderate water temperature and may impact the stream water quality by reducing spray drift and runoff to aquatic areas. Herbicide effects on vegetation losses in these areas may have significant effects of the suitability of these areas as habitats and food sources for endangered animal species. Reductions in acceptable habitat and limited resources are the major factors affecting many endangered and threatened species, whether they be plants, insects, clams and mussels, aquatic invertebrates, fish, birds or mammals.

Uncertainty also exists concerning the extent of atrazine effects on homing and reproduction in endangered salmon and other anadromous fish species. The laboratory study of olfactory function in mature Atlantic salmon parr and the effect of atrazine in the range of 0.5 µg/L for sensing female hormones in urine and behavior to ground salmon skin is notable. This is so especially if the effects are significant on salmon reproduction at such a low atrazine concentration, because existing concentrations in streams inhabited by endangered salmonids may exceed this level for prolonged periods. Atrazine concentrations are likely to be their highest in the late spring and early summer following applications, at a time when salmon are returning from the ocean to spawn. It is unclear from the results of the test by Moore and Waring (1998) whether the effect on olfactory function is manifested in mature adult salmon and what effect it might have on reproduction and recruitment. These data are preliminary and additional studies are necessary to determine if there are adverse atrazine effects on adult salmon homing and adult male milt production responses to female hormones in ovulating female urine. Further study is also needed on whether those effects could be significant to reproduction and recruitment.

Case No: 0???
Chemical No: 080803

ENVIRONMENTAL FATE
DATA REQUIREMENTS FOR
ATRAZINE

Data Requirement	Use Pattern[1]	Does EPA Have Data To Satisfy This Requirement? (Yes, No, or Partially)	Bibliographic Citation	Must Additional Data Be Submitted under FIFRA 3(c)(2)(B)?
§158.290 ENVIRONMENTAL FATE				
Degradation Studies-Lab:				
161-1 Hydrolysis	ABCJK	yes	40431319	no
161-2 Photodegradation In Water	ABCJK	yes	42089904	no
161-3 Photodegradation On Soil	ABCJK	yes	40431320,42089905	no
161-4 Photodegradation In Air				no
Metabolism Studies-Lab:				
162-1 Aerobic Soil	ABCJK	yes	42089906	no
162-2 Anaerobic Soil	ABCJK	yes	42089906	no
162-3 Anaerobic Aquatic	ABCJK	yes	40431323	no
162-4 Aerobic Aquatic	ABCJK	no		yes
Mobility Studies:				
163-1 Leaching- Adsorption/Desorp.	ABCJK	yes	40331324,40431327,40431325 40431328,40431326	no
163-2 Volatility (Lab)	ABCJK	no		yes
163-3 Volatility (Field)	ABCJK	no		???
Dissipation Studies-Field:				
164-1 Soil Dissipation	ABCJK	yes	42165504,42165505,40431336, 42165506,40431337,421655507	no
164-2 Aquatic (Sediment)	ABCJK	no		yes
164-3 Forestry	ABCJK	yes	40431340,42041405	no
164-5 Soil, Long-term	ABCJK	yes	40431339, 42089911,40431337 42089912,40431338,42089909 40431336,42089910	no
Accumulation Studies:				
165-3 Irrigated Crops				

165-4	In Fish	ABCJK		yes	40431344	no
165-5	In Aquatic Non-Target Org.	ABCJK	no			yes

Ground Water Studies:

166-1	Ground Water Small Prosp.
166-2	Ground Water Small Retro.

Surface Water Studies:

167-1	Field Runoff
167-2	Surface Water Monitoring

§158.440 Spray Drift:

201-1	Droplet Size Spectrum	ABCJK		no		yes
202-1	Drift Field Evaluation	ABCJK		no		yes

[1] Use Patterns: A=Terrestrial Food Crop; B=Terrestrial Feed Crop; C=Terrestrial Non-Food Crop; D=Aquatic Food Crop; E=Aquatic Non-Food Outdoor; F=Aquatic Non-Food Industrial; G=Aquatic Non-food Residential; H=Greenhouse Food Crop; I=Greenhouse Non-Food Crop; J=Forestry; K=Outdoor Recreation; L=Indoor Food; M=Indoor Non-Food; N=Indoor Medical; O=Indoor Residential; Z=Use Group for Site 00000

* In Bibliographic Citation column indicates study may be upgradeable

Date: November 2000
Case No:
Chemical No: 080803

PHASE IV
DATA REQUIREMENTS FOR
ECOLOGICAL EFFECTS BRANCH

Data Requirements	Composition[1]	Use Pattern[2]	Does EPA Have Data To Satisfy This Requirement? (Yes, No)	Bibliographic Citation (MRID)	Must Additional Data Be Submitted under FIFRA3(c)(2)(B)?
6 Basic Studies in Bold					
71-1(a) Acute Avian Oral, Quail/Duck	TGAI	ABCJK	yes	00024721	no
Northern Quail to be tested	3 Major Degradates	ABCJK	no		yes
71-1(b) Acute Avian Oral, Quail/Duck	(TEP)				no
71-2(a) Acute Avian Diet, Quail	TGAI	ABCJK	yes	00022923	no
	Degradates	ABCJK	no		reserved
71-2(b) Acute Avian Diet, Duck	TGAI	ABCJK	yes	00022923	no
71-3 Wild Mammal Toxicity					no
71-4(a) Avian Reproduction Quail	TGAI	ABCJK	yes	42547102	no
	Degradates	ABCJK	no		reserved
71-4(b) Avian Reproduction Duck	TGAI	ABCJK	yes	42547101	no
	Degradates	ABCJK	no		reserved
71-5(a) Simulated Terrestrial Field Study					no
71-5(b) Actual Terrestrial Field Study					no
72-1(a) Acute Fish Toxicity Bluegill	TGAI	ABCJK	yes	00024717	no
	Major Degradate	ABCJK	no		yes
72-1(b) Acute Fish Toxicity Bluegill	(TEP)				
72-1© Acute Fish Toxicity Rainbow Trout	TGAI	ABCJK	yes	00024716	no
	Major Degradate	ABCJK	no		yes
72-1(d) Acute Fish Toxicity Rainbow Trout	(TEP)				
72-2(a) Acute Aquatic Invertebrate Toxicity	TGAI	ABCJK	yes	00024377	no
	Major Degradate	ABCJK	no		yes
72-2(b) Acute Aquatic Invertebrate Toxicity	(TEP)				
72-3(a) Acute Estu/Mari Tox Fish	TGAI	ABCJK	yes	43344901	no
	Major Degradate	ABCJK	no		yes

Date: November 2000
Case No:
Chemical No: 080803

PHASE IV
DATA REQUIREMENTS FOR
ECOLOGICAL EFFECTS BRANCH

Data Requirements	Composition[1]	Use Pattern[2]	Does EPA Have Data To Satisfy This Requirement? (Yes, No)	Bibliographic Citation (MRID)	Must Additional Data Be Submitted under FIFRA3(c)(2)(B)?
72-3(b) Acute Estu/Mari Tox Mollusk	TGAI	ABCJK	no		yes
	Major Degradate	ABCJK	no		yes
72-3© Acute Estu.Mari Tox Shrimp	TGAI	ABCJK	yes	43344902	no
	Major Degradate	ABCJK	no		yes
72-3(d) Acute Estu/Mari Tox Fish	(TEP)				
72-3(e) Acute Estu/Mari Tox Mollusk	(TEP)				
72-3(f) Acute Estu/Mari Tox Shrimp	(TEP)				
72-4(a) Early Life-Stage Fish (Freshwater)	TGAI	ABCJK	no	45208304	no
	Major Degradate	ABCJK	no		reserved
72-4(a) Early Life-Stage Fish (Marine)	TGAI	ABCJK	no	45202920 *	yes
72-4(b) Life-Cycle Aquatic Invertebrate	TGAI	ABCJK	yes	00024377	no
	Major Degradate	ABCJK	no		reserved
72-4(b) Life-Cycle Marine Invertebrate	TGAI	ABCJK	no	45202920 *	yes
	Major Degradate	ABCJK	no		reserved
72-5 Life-Cycle Fish	TGAI	ABCJK	yes	00024377	no
	Major Degradate	ABCJK	no		reserved
72-6 Aquatic Org. Accumulation					
72-7(a) Simulated Aquatic Field Study					
72-7(b) Actual Aquatic Field Study					
122-1(a) Seed Germ./Seedling Emerg.	TEP				
122-1(b) Vegetative Vigor	TEP				
122-2 Aquatic Plant Growth					
123-1(a) Seed Germ./Seedling Emerg.	TEP	ABCJK	yes	42041403	no
123-1(b) Vegetative Vigor	TEP	ABCJK	yes	42041402	no

Date: November 2000
Case No:
Chemical No: 080803

PHASE IV
DATA REQUIREMENTS FOR
ECOLOGICAL EFFECTS BRANCH

Data Requirements	Composition[1]	Use Pattern[2]	Does EPA Have Data To Satisfy This Requirement? (Yes, No)	Bibliographic Citation (MRID)	Must Additional Data Be Submitted under FIFRA3(c)(2)(B)?
123-2 Aquatic Plant Growth	TGAI	ABCJK	yes	41065203a 41065203b 43074801 43074802 43074803	no
124-1 Terrestrial Field Study					
124-2 Aquatic Field Study					
141-1 Honey Bee Acute Contact	TGAI	ABCJK	yes	00036935	no
141-2 Honey Bee Residue on Foliage	TEP		no		no
141-5 Field Test for Pollinators	TEP		no		no

[1] Composition: TGAI=Technical grade of the active ingredient; PAIRA=Pure active ingredient, radiolabeled; TEP=Typical end-use product

[2] Use Patterns: A=Terrestrial Food Crop; B=Terrestrial Feed Crop; C=Terrestrial Non-Food Crop; D=Aquatic Food Crop; E=Aquatic Non-Food Outdoor; F=Aquatic Non-Food Industrial; G=Aquatic Non-food Residential; H=Greenhouse Food Crop; I=Greenhouse Non-Food Crop; J=Forestry; K=Outdoor Recreation; L=Indoor Food; M=Indoor Non-Food; N=Indoor Medical; O=Indoor Residential; Z=Use Group for Site 00000